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A Case of Epiphyseal Dysplasia in a Dog

BY
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IN this paper, a brief account is given of the radiological and pathological features of a condition which, so far as the writers know, has not been recorded previously in the dog. This report may encourage others to keep a watch for such lesions and thus provide an opportunity of a fuller examination in a future case than was possible in the present instance. The dysplasia shows a considerable resemblance in some of its features to the two human conditions of epiphyseal dysplasia classified by Fairbank (1951) as dysplasia epiphysalis multiplex and dysplasia epiphysalis punctata.

Dysplasia epiphysalis multiplex is, in man, "a rare congenital developmental error characterised by mottling or irregularity in density and outline of several of the developing epiphyses, dwarfism and stubby digits," while the chief characteristic of dysplasia epiphysalis punctata "is the presence of a number of discrete centres of unusual density in many cartilaginous epiphyses and apophyses," as is indicated by the synonym "stippled epiphyses."

The subject of this report, a male Miniature Poodle puppy, was first examined at the age of 10 weeks when treatment was sought for parasitic otitis. At that time a slight enlargement of the joints suggested incipient rickets, but apart from this the puppy was lively and in good health. A course of dicalcium phosphate with vitamin D was prescribed. When next seen, three months later, the puppy was grossly abnormal, being stunted in growth and showing a great enlargement of all the joints of the limbs. It was listless and disinclined to move; when forced to walk it did so with a clumsy sprawling gait. Passive manipulation of the limbs did not appear to cause pain. The owner affirmed that the treatment previously prescribed had been carried out, and in view of the apparent absence of favourable response the dog was destroyed. The radiographs were obtained *post-mortem*.

Radiological Appearances

The whole skeleton is involved (Fig. 1). All the bones are of markedly low radiodensity, and many are deformed, apparently by their inability to withstand the stresses to which the skeleton is normally exposed.

The most conspicuous abnormalities involve the long bones (Figs. 2 and 3). The epiphyses of these with few exceptions show gross irregularities of form and of density, the general appearance suggesting that each contains multiple centres of ossification that are independent of each other, or only tenuously connected. There is, however, considerable variation in their appearance: some seem to consist of relatively few centres and have a granular appearance, while others are more diffuse as though composed of many separate centres that have run together. The stifle region illustrates this distinction: the distal epiphysis of the femur is of the diffuse, the proximal epiphysis of the tibia of the granular variety. In addition to these anomalies of internal structure most epiphyses show distortions of their general form, being expanded beyond their usual limits and in some instances overhanging the metaphyseal regions of the shafts. The cartilage that separates the ossification centres from the metaphysis is thickened, and irregular on the epiphyseal side.

The shafts of the long bones are also involved, being short, with grossly expanded extremities, thus giving the bone a very "waisted" appearance.

Abnormalities of the short bones, though present, are less evident, and consist of irregularities of density of ossification. The flat bones are affected by the excessive softness of the skeleton, and in particular the pelvis is greatly deformed by lateral compression between the acetabula (Fig. 2).

The axial skeleton has not escaped (Fig. 4). All regions of the spine show changes that are mainly

due to the compression of the osteoporotic bone; in the thoracolumbar region there have been formed tongues of bone that project ventrally from the vertebral bodies as though extruded by force. Many of the epiphyses are fragmentary; some scattered points of ossification are situated in such a way that it is difficult to see whether they belong to the epiphysis or the body of the vertebrae. The coccygeal vertebrae are least affected. The intervertebral spaces are wide, unequal, and of an exaggerated biconvexity.

The ribs are poorly ossified and are expanded at their distal extremities; the sternum also shows irregular ossification.

The skull shows marked osteoporosis, and the bones of the vault show a fine stippling. A degree of shortening of the face with an accompanying projection of the mandible is present, but this may well be an independent anomaly. The teeth appear to be normal.

Everywhere it is evident that the bone most recently produced is of a denser nature than that formed earlier—presumably the result of the calcium and vitamin D therapy.

Epiphyseal Histopathology

The epiphyseal lines are narrow and regularly and evenly eroded on the metaphyseal side. Some bands of slightly foamy mucoid appearance traverse the epiphyseal plate, and some blood vessels may cross the plate into areas of mucoid matrix in the epiphysis. In the epiphysis, there is usually one major centre of ossification, which is near the epiphyseal plate (Fig. 5). This centre shows irregular projections into the epiphyseal cartilage mass. Myeloid tissue is present in the centre of ossification, and thin or wide seams of bone lie on the eroded cartilage surfaces. Osteoblasts and osteoclasts are seen. A number of smaller areas of vascular erosion, sometimes with endochondral ossification, appear to be arranged peripherally, and may be separate from the major ossification centre. The cartilage of the epiphysis shows variability of the basophil staining of the matrix, and in places, particularly around small vessels, the matrix appears to be mucoid and not cartilaginous, and may appear slightly foamy. Some areas of necrosis of cartilage are present in the neighbourhood of an ossification centre or of an area of mucoid tissue.

It is concluded that the patchy density of the epiphyses in the radiographs is due to the presence of patchily-distributed endochondral ossification centres.

Discussion

In dysplasia epiphysalis punctata the epiphyses appear stippled in radiographs, as if ossifying from many separate centres. The spots are of varying size, and most of them are small and usually discrete. It appears that the spots may become smaller and fewer in number, or may tend to fuse to form a single, more normal, centre of ossification. The spots often appear at an earlier date than that at which ossification normally begins in the epiphysis concerned.

In dysplasia epiphysalis multiplex, the principal change in the epiphysis is irregularity in ossification. The centres are irregular both in density and shape, being mottled and often mulberry-like in outline. Separate subsidiary centres around the main centre are common, resulting in some peripheral stippling. Fairbank describes a number of differences between the two conditions—multiplex and punctata—mentioning, for example, the occurrence of congenital bilateral cataract in punctata cases, but he suggests that if a case could be followed for a few years, and the spots of ossification were given time to fuse, the distinction would probably become difficult.

As the lesions seen in this dog cannot be identified as being of either multiplex or punctata type, the broad term "epiphyseal dysplasia" is employed to denote the condition present. The marked osteoporosis also present may indicate some fundamental defect in ossification, of which the epiphyseal dysplasia was also an expression.

Summary

The radiological and histopathological features of epiphyseal dysplasia in a five-and-a-half-month-old Miniature Poodle male dog are described.

Reference

FAIRBANK, Sir Thomas. (1951). An Atlas of General Affections of the Skeleton. Edinburgh and London: E. & S. Livingstone. 91 ff.

MOBILE INFORMATION UNITS

As part of the drive towards increased agricultural productivity, 17 mobile information units are to be operated by the Ministry of Agriculture, Fisheries and Food from provincial centres throughout the country. Each unit consists of a rear projection daylight film installation mounted on a 16-ft. trailer. Between film shows, one side of the trailer can be opened up to form a canopied bookstall.

The centres will be set up at County agricultural shows and at a variety of other places at the discretion of local Ministry officers. They will serve the needs of the four main services of the Ministry, namely the National Agricultural Advisory Service, the Agricultural Land Service, the Infestation Control Service and the Veterinary Service.

The scheme has been financed out of a small part of the £625,000 economic aid grant made by the United States in 1953 to help Britain's agricultural productivity.

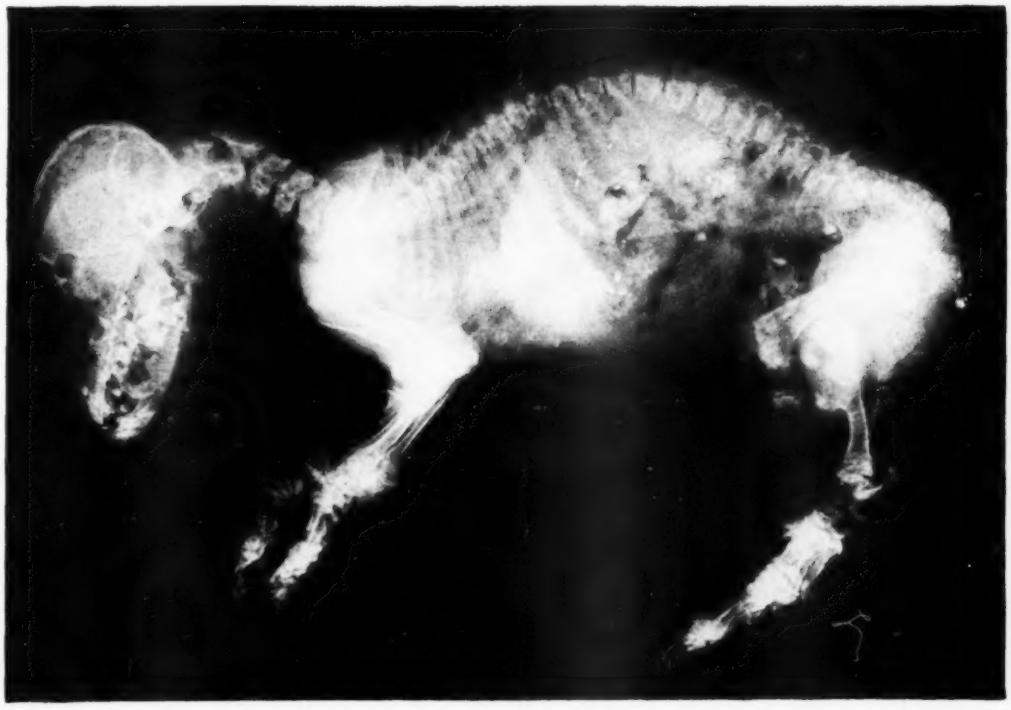

FIG. 1.—Radiograph of the intact carcase showing the general conformation and distribution of the lesions.

FIG. 2.—Dorsal view of the pelvis.

FIG. 3.—Posterior view of the hind limb.

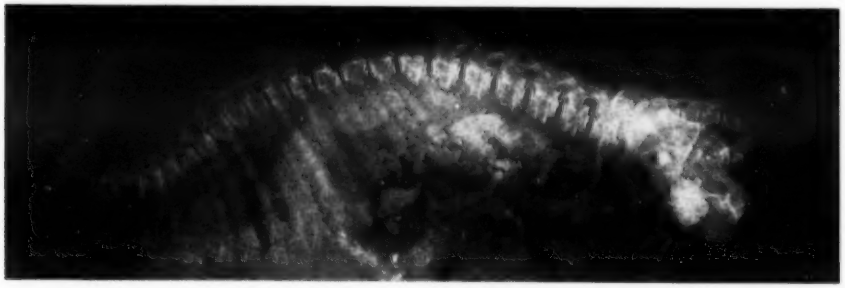

FIG. 4.—Lateral view of the spine. The most conspicuous abnormalities affect the thoracolumbar region.

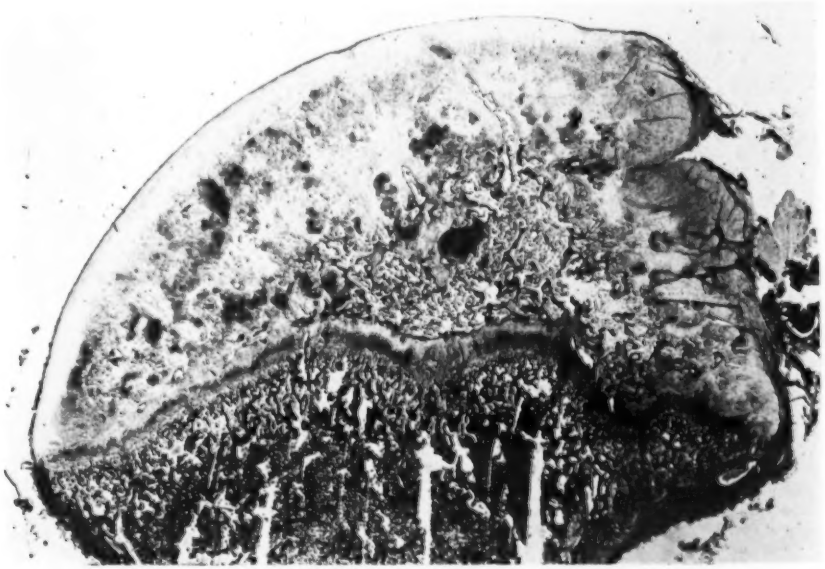

FIG. 5.—Epiphysis of lower femur, showing irregular centre of ossification.

Piperazine-1-Carbodithioic Acid as an Anthelmintic Against *Parascaris equorum* in Horses

BY

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Introduction

FOLLOWING the introduction of piperazine-1-carbodithioic acid (Safersan) as an anthelmintic for *Ascaris lumbricoides* and *Oesophagostomum dentatum* in swine (Leiper, 1954) attention was turned to its capabilities in the horse (Poynter, 1956), where, when given at 100 mg. per kg. bodyweight, it was found to be efficient against the small strongyles. The results obtained for *Parascaris equorum* were promising but could not be considered significant since only one horse harbouring this parasite was given the compound at the above rate. It was, therefore, deemed desirable to further investigate the potentialities of the anthelmintic against *P. equorum* at the dosage rate of 100 mg. per kg. bodyweight, especially as it was known to be efficient at 166 mg. per kg. bodyweight.

Experimental Procedure

Piperazine-1-carbodithioic acid was administered to 12 horses, two two-year-old Thoroughbreds and 10 yearling cross-bred ponies at the rate of 100 mg. per kg. bodyweight. The Thoroughbreds were given the compound in bran mash and although they were reluctant to consume the whole of their medicated feeds, they readily did so when a little corn was added to the residues. The ponies were kept in an open paddock and the compound was administered to them by means of a stomach tube, each dose being dispersed in about 700 ml. of water.

In the case of the Thoroughbreds, which were kept in boxes, all faeces passed after treatment were collected and examined for the presence of ascarids and bot larvae, egg counts were also performed before and for five consecutive days after administration of the anthelmintic. It was not practical to collect all faeces passed by the treated ponies and therefore information as to the effect of the anthelmintic was obtained by examination of faecal samples for nematode eggs on the day of and for five consecutive days after dosing.

Results

The results are summarised in Table I. It is apparent that, judging from reductions in egg counts, the compound was efficient against *Parascaris equorum*. The strongyle egg counts were also markedly reduced but in only one horse were consistently negative results obtained. The amount of reduction seen in the strongyle egg counts is known to be inversely related to the amount of infestation with the genus *Strongylus*, especially *S. edentatus*, against which the compound possesses little, if any, efficiency ; the greater the infestation with *Strongylus* spp., the less the reduction in strongyle egg count.

TABLE I

THE RESULTS OF DOSING 12 HORSES WITH PIPERAZINE-1-CARBODITHIOIC ACID AT 100 MG. PER KG. BODYWEIGHT. EGG COUNTS ARE SHOWN FOR THE DAY OF DOSING, D, AND FOR FIVE SUBSEQUENT CONSECUTIVE DAYS. THE STOLL DILUTION TECHNIQUE AND THE CLAYTON LANE DIRECT CENTRIFUGAL FLOTATION TECHNIQUE WERE EMPLOYED TO DEMONSTRATE NEMATODE EGGS

Animal	Breed	Age (years)	Ascarid e.p.g.						Strongyle e.p.g.					
			D	1	2	3	4	5	D	1	2	3	4	5
1	Thoroughbred	2	600	600	0	0	0	0	270	35	1	0	0	0
2	"	2	300	200	0	0	0	0	900	272	2	37	52	65
3	Cross-bred pony	1	100	0	0	0	0	0	169	131	6	0	0	4
4	" "	1	100	100	100	0	0	0	71	51	2	1	0	10
5	" "	1	600	100	100	0	0	0	149	299	7	9	0	42
6	" "	1	200	500	100	0	0	0	336	140	2	21	7	7
7	" "	1	200	500	200	100	0	0	56	47	4	6	0	5
8	" "	1	200	100	0	0	0	0	105	131	0	9	2	5
9	" "	1	200	100	0	0	0	0	282	284	26	11	5	20
10	" "	1	800	800	200	100	0	0	390	500	1	0	21	30
11	" "	1	100	1	0	0	0	0	81	194	0	1	10	1
12	" "	1	100	200	100	0	0	0	314	185	4	0	10	19

In Table II are shown the numbers of ascarids and bot larvae voided after treatment by animals 1 and 2. The appearance of ascarids in the faeces, coupled with the consistently negative egg counts found after treatment is indicative of the compound being an efficient anthelmintic against *Parascaris equorum* when given at 100 mg. per kg. bodyweight.

As will be seen in Table II, animal No. 2 passed, after treatment, 14 bot larvae, 13 of which were *Gastrophilus intestinalis* and one *G. nasalis*, these were found on the fourth and fifth days after administration of the compound. Faeces examined for the next four days

TABLE II

THE NUMBERS OF ASCARIDS AND BOTS PASSED BY TWO HORSES AFTER RECEIVING 100 MG. OF PIPERAZINE-1-CARBODITHIOIC ACID PER KG. BODYWEIGHT. FAECAL EXAMINATIONS WERE CONTINUED UNTIL AT LEAST THREE CLEAR DAYS HAD SHOWN NEGATIVE RESULTS

Animal	*Parascaris equorum*		*Gastrophilus* spp.
	Mature	Immature	
1	20	5	0
2	11	7	14

showed no further parasites and collection was, therefore, suspended. The animal was dosed on March 2nd, 1956, and the subsequent finding of bot larvae in the faeces makes it tempting to postulate a relationship to the treatment given. The other possibility which must be considered is that the larvae were being voided naturally, allowing a pupation period of three to five weeks, this means that the mature flies would have been on the wing in April. In 1954 the author first observed bot eggs on August 9th, the presence of adult bot flies in April would be unusual and it is, therefore, held to be likely that piperazine-l-carbodithioic acid caused in this horse the expulsion of at least some of its *Gastrophilus* burden.

No attempt was made to collect from the ponies all the faeces they passed after treatment. Samples were, however, taken every day for the purpose of carrying out egg counts and in these were found specimens of mature and immature *Parascaris equorum*, mature *Oxyuris equi*, mature *Trichonema* spp., mature *Triodontophorus* spp. and larval *Gastrophilus intestinalis*.

Discussion

Piperazine-l-carbodithioic acid is a valuable anthelmintic, it is an equimolecular compound of piperazine and carbon disulphide and in an acid medium it breaks down into its constituents. In past years carbon disulphide has been widely used to control both *Gastrophilus* larvae and ascarids in foals and yearlings. The piperazine compounds have now largely replaced carbon disulphide as the drug of choice for ascarids in foals but critical tests using piperazine adipate have shown that it has no effect on *Gastrophilus* larvae in the equine stomach (Poynter, 1955 ; Downing, Kingsbury & Sloan, 1955). Piperazine-l-carbodithioic acid is known to have an *in vitro* effect upon these larvae (Poynter, 1956) but although it does in some cases appear to cause their voidance from horses, there can be no doubt that it is not completely effective, for Leiper (1954) found 35 in the stomach of a horse which had received 150 mg. per kg. bodyweight of the compound.

The replacement of carbon disulphide by piperazine salts is, then, leaving treated horses with some *Gastrophilus* larvae in their stomachs. To what extent these larvae are the cause of disease is largely a matter of conjecture, some clinicians are inclined to ignore them as being of no consequence but others speak of unthriftiness and "bot colic" and their successful treatment by carbon disulphide. Last year the Equine Research Station received communications from practitioners who, though reporting good results with piperazine, expressed the opinion that unthriftiness attributable to bots had become more marked since they had abandoned carbon disulphide. How far such considerations can be evaluated for their true scientific context is, of course, a matter about which argument is futile, but nevertheless observations of the above nature may well be the first indication of *Gastrophilus* populations being allowed to flourish with no control and reach pathogenic significance. Mönnig (1947) states that the most serious effect of the parasite is due to its toxic excretions to which the animal becomes hypersensitive and which produce general debility. Hutyra, Marek & Manniger (1946) mention "severe cases of invasion being usually seen in foals of eight months to three years" and they conclude that, "the affection in such animals is frequently fatal." In view of the remarks of these authors it becomes apparent that bots cannot lightly be dismissed as of no consequence to the health of the horse, although it will, perhaps, be agreed that Hutyra *et al* (*loc. cit.*) painted too gloomy a picture in their prognosis of the affection proving "frequently fatal."

It should be pointed out that *Gastrophilus* larvae are seasonal inhabitants of the horse's stomach. The adult flies can be seen on the wing from early summer until September. They lay eggs on the hairs which hatch in 9 to 12 days. The larvae wander in the tissues of the tongue for 21 to 28 days and then, having developed to the second stage, they pass to the stomach. They normally leave the horse in May or June to pupate on the pasture. The total time spent in the alimentary canal of the host is about 10 months. It is consequently from about October onwards through the first months of the year that clinical symptoms, possibly referable to *Gastrophilus* infestation, are likely to be seen. The most critical factor in the production of these adverse effects might well be the magnitude of the infestation ; while the numbers and proportions of the three species which may be present, may exert a varying influence upon pathogenesis.

It is envisaged then that the replacement, in the treatment of ascariasis, of carbon disulphide by the piperazine compounds may lead to an increase in the numbers of *Gastrophilus* larvae with consequent adverse effects upon the hosts. It seems, therefore, worth pointing out that "bots" must be considered as possible causal agents in cases which may arise where horses, particularly foals, show vague symptoms of unthriftiness even after treatment with piperazine.

Unfortunately, there is at present no readily applicable method for determining the presence of *Gastrophilus* larvae in the equine stomach. The only method available to the veterinary surgeon is the experimental dosing of the suspected horse with carbon disulphide and observation of the presence of the larvae in subsequently voided faeces.

Summary and Conclusions

1. As a result of trials on 12 horses, it is concluded that piperazine-l-carbodithioic acid is an efficient anthelmintic against *Parascaris equorum* when administered at 100 mg. per kg. bodyweight.

2. It is pointed out that the replacement of carbon disulphide by piperazine as the drug of choice for the treatment of ascarid infestations allows *Gastrophilus* spp. larvae to proceed unhindered in their development. If these insect parasites are the cause of unthriftiness, then

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Simultaneous Inoculation of Swine Fever Serum and Crystal Violet Vaccine

BY

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D'APICE & Penha (1952) reported that the simultaneous inoculation of 10, 20 or 30 c.c. anti-swine fever serum intramuscularly and 1 c.c. of crystal violet vaccine intradermally in the ear protected pigs against 2 c.c. of virus either 5 or 60 days later. They recommended this procedure on infected herds as it required only one intervention. When vaccine and serum were given intramuscularly, the pigs were not protected when challenged 60 days later; this method conferred only a passive immunity, the serum interfering with the antigenicity of the vaccine. There is little to be gained by using vaccine alone on an infected herd because of the lag—about 14 days—between vaccination and the establishment of immunity. American investigators (1953) repeated the work of D'Apice and Penha using three different batches of glycerol crystal violet vaccine; with one batch that had been incubated for 14 days the pigs were not protected when challenged 50 days later; with a second batch, also incubated for 14 days, good protection was present 90 days later; the third batch of vaccine was incubated for only seven days and all pigs were protected—the interval between vaccination and challenge in this test was not stated. It is possible that a glycerol vaccine incubated for only seven days might contain some living virus and, in that case, it would confer a good immunity when inoculated simultaneously with serum.

McBryde & Cole (1936) stated that when vaccine and serum were given subcutaneously, either simultaneously or serum given within seven days of vaccination, the antigenicity of the vaccine was adversely affected by the serum. Cole & Henley (1946) pointed out that there was no advantage in giving vaccine and serum simultaneously by the subcutaneous route. Their results indicated that vaccine did not interfere with the action of serum; but serum affected the antigenicity of vaccine and that it was useless to vaccinate pigs within four weeks of serum treatment. The degree to which antigenicity was affected varied from very slight with small doses (10 c.c.) of serum and large doses (20 to 30 c.c.) of vaccine to 100 per cent. with standard doses (15 to 35 c.c.) of serum and the standard dose (5 c.c.) of vaccine. They stated: "The duration of serum alone immunity has been reported to be anywhere between three and four months. In this experiment the serum alone immunity persisted for four weeks, but had expired at three months." The statement that serum immunity lasts as long as three months is contrary to general experience both under laboratory and field conditions.

Edgington (1946) reported that many pigs treated with serum and vaccine and challenged at 30 days or longer, after treatment had a high degree of protection. Doyle & Wright (1947) showed that serum may be given either five days before or five days after vaccine without adversely affecting the antigenicity of the vaccine when challenged 90 days later. When serum has been used on pigs in the field it is customary to vaccinate them after an interval of 10 days and the results have apparently been satisfactory. Cole & Henley (1949) believe that if serum is given before vaccine it may interfere for at least 28 days with the antigenicity of the vaccine. Doyle & Spears (1955) found the intradermal injection of vaccine in the ear to be a delicate and time-consuming procedure that would be impracticable on any considerable scale under field conditions. The amount that can be readily injected intradermally is too small to confer a durable immunity; but a small dose, given intradermally or subcutaneously in the ear, confers a better protection than the same dose injected either subcutaneously or intramuscularly in one of the usual sites. Vaccine given subcutaneously in the ear required more time for the establishment of immunity than when given intradermally, but it appeared to confer better protection. In these tests the vaccine was therefore given subcutaneously in the ear.

Present Investigation

A group of 20 pigs (Table I), approximately the same size and weight (about 60 lb.) were inoculated simultaneously with vaccine subcutaneously in the ear and serum intramuscularly; at varying intervals later two pigs were removed from the group and

indications of this may be seen during the autumn and winter.

Acknowledgments.—The author acknowledges with thanks the piperazine-l-carbodithioic acid (Safersan) which was kindly supplied by Boots Pure Drug Co., Ltd.

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TABLE I

VACCINE-SERUM TREATED PIGS TESTED AGAINST INOCULATION OF VIRUS

Pig No.	Vaccine and serum simultaneously	Virus after vaccine and serum. Days	Result	Virus control pigs	Result
6866	One c.c. of vaccine s/c	5	Remained normal	7249	Died 10th day
6982	in the ear and 30 c.c.	12	" "	7082	" 8th "
6974	serum intramuscu-	14	" "	7084	" 11th "
6864	larly	17	" "	7069	" 8th "
6971		19	Died 16th day	7081	" 14th "
6991		21	Remained normal	7073	" 7th "
6861		24	" "	7079	" 13th "
6983		60	" "	6972	" 11th "
6863		83	Died 11th day	7701	" 18th "
6979		106	Reacted-recovered	7524	" 8th "
	VACCINE-SERUM TREATED PIGS TESTED AGAINST CONTACT INFECTION				
6865	One c.c. of vaccine s/c	5	Remained normal	7003	" 15th "
6986	in the ear and 30 c.c.	12	" "	7293	" 13th "
6989	serum intramuscu-	14	Died 20th day	7291	" 10th "
6975	larly	17	Remained normal	7279	" 11th "
6869		19	" "	7280	" 15th "
6976		21	" "	7281	" 13th "
6867		24	Died 8th day	7284	" 8th "
6983		60	Remained normal		
6868		83	Died 13th day	7702	" 12th "
6992		106	" 20th "	7528	" 11th "

tested for immunity. One pig of each pair was tested by the subcutaneous inoculation of 1,000 M.L.D. of virus and the other by contact with infected pigs. The test virus was that used in the routine preparation of vaccine and it invariably killed susceptible pigs. The immunity tests were therefore severe and all control pigs died. The vaccine and serum used were both of high potency.

One only of the vaccinated pigs tested against the inoculation of virus died within the period of 60 days; and two of those tested against contact infection died within the same period. The protection conferred appeared to fade out after 60 days.

The simultaneous injection of serum and vaccine failed to protect pigs challenged 60 days later.

Discussion

Immunity tests on pigs inoculated simultaneously with vaccine subcutaneously in the ear and serum intramuscularly, suggest the method might occasionally be of value, but in view of the labour involved, it could be recommended only in special circumstances, *e.g.*, disease in a valuable herd or for a few special animals on an infected premises. The value of the method would appear to depend on the ratio of serum to vaccine used. To obtain consistent results it would be essential to know the minimum protective dose of each batch of serum in relation to weight of pig; but this information is never given with commercial serum and is for ordinary purposes unnecessary. The antigenicity of the vaccine is more adversely affected by a large than by a small dose of serum and more by potent than by weak serum. In addition, there is the further complication that different batches of vaccine vary considerably in potency. Having regard to these facts, the vaccine-serum simultaneous method is unlikely to give consistent results. For example, in one American test the pigs were not protected when challenged at 50 days whereas in a second test with a different batch of vaccine they were protected at 90 days. In our tests it would appear that the antigenicity of the vaccine was affected by the relatively large dose of potent serum as shown by the short period of protection. Furthermore, for the method to be of value in the field it would be necessary to inoculate early

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TABLE II

TEST ON SIX PIGS; THREE TESTED AGAINST THE INOCULATION OF VIRUS (1,000 M.L.D.) AND THREE AGAINST CONTACT INFECTION

Pig No.	Vaccinated pigs				Controls		
	Vaccine and serum simultaneously	Tested by	Tested after treatment. Days	Result	Pig No.	Tested by	Results
7991	One c.c. of vaccine	Inoculation	5	Remained normal	8084	Inoculation	Died 8th day
8013	subcutaneously in	Contact	5	" "	8083	Contact	" 14th "
8005	the ear and 30 c.c.	Inoculation	60	Died 12th day	8281	Inoculation	" 8th "
7998	of serum intra-	Contact	60	" 17th "	8274	Contact	" 12th "
8010	muscularly	Inoculation	100	Remained normal	8709	Inoculation	" 12th "
7996		Contact	100	Died 23rd day	8706	Contact	" 13th "

The Laboratory Mouse in Great Britain.—II. Intercurrent Infection (Infantile Diarrhoea)

BY

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A RECENT survey by the Laboratory Animals Bureau (Lane-Petter, Barber & King, 1955) demonstrated very clearly the great importance of the laboratory mouse in all branches of biological science—in both research and industry. But this survey also showed that the general quality of the animals in use was not as satisfactory as it might be, and the question was further discussed in an earlier paper by the present writer (Tuffery, 1956). Laboratory mice may be unsatisfactory for a variety of reasons, but undoubtedly one of the most important of these is the presence of intercurrent infection. A survey designed to evaluate this problem has recently been completed, and it is proposed to describe the general situation with regard to mouse disease as far as it can be determined at present. The scope of this survey has been described in the first paper of this series, where general "mouse-husbandry" practice in this country was summarised.

Records of actual numbers of losses sustained by each of the colonies visited have not been collected, because such figures would show little of real value. Any figures collected would probably not differ greatly from those of the earlier survey (Lane-Petter, Barber & King, 1955), and would be no more accurate. Only three colonies could produce records of disease incidence which were likely to be at all accurate; in most cases, records of losses were not kept in any detail. Most colonies conduct very few *post-mortem* examinations on mice not actually used for experimental purposes.

Among those mice which are examined at death, or after being culled, there is always the risk of incorrect diagnosis. A mouse at autopsy, for example, may be found to have a number of tapeworm cysts in its liver and be recorded as "death, due to *Taenia crassicollis* infection" while in fact the true cause of death was a *Salmonella* infection which remained undetected because a bacteriological examination was not undertaken. The example is perhaps unlikely, but it does illustrate a point which needs to be taken into consideration when records of infection within a colony are being examined. However, the findings discussed throughout this paper are consistent, and errors of this sort are unlikely to have occurred too frequently and will not effect broad generalisations.

One may differentiate three general reasons why intercurrent infections in mouse colonies are undesirable. In the first case, an infection may reduce the production rate to an uneconomic level—infantile diarrhoea falls in this category. Secondly, in the vitiation of experimental results—either by simply killing off the animals before the conclusion of the experiment or, in a more subtle manner, by replacing the original inoculum in the course of serial passage, such as appears to have occurred in the case of the C-SK virus, for example (Melnick, 1951). Finally, the presence of an infection may make it desirable that larger groups than otherwise be used, a procedure which may give statistically significant results but which cannot be considered really satisfactory even if one could always afford the expense.

There are many agents capable of infecting mice and rendering them unsuitable for use, and each may function in a different way, or in a number of different ways. Some may cause a frank epidemic which characteristically flares up and causes a high mortality, to die out afterwards; others merely kill

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Simultaneous Inoculation of Swine Fever Serum and Crystal Violet Vaccine—*concluded.*

in an outbreak—not always easy to achieve—and then only healthy pigs; and to confer a durable immunity a second dose of vaccine *alone* would be essential between the 40th and 50th day.

Conclusion

The simultaneous inoculation of vaccine subcutaneously in the ear and serum intramuscularly cannot be recommended as a routine procedure for the control of outbreaks of swine fever. The method is unlikely to give consistent results and the labour involved makes it impracticable under field conditions. In certain special circumstances the method might be worthy of trial.

Acknowledgments.—To Dr. H. Cox, Lederle Laboratories Division, Cynamid Products Ltd., New York, for generously presenting the anti-swine fever serum; and to Dr. A. T. Mennie, Cynamid Products Ltd., London, through whose courtesy the serum was obtained. To Mr. R. Martin, for technical assistance.

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at a low steady rate. Yet others may give rise either to a sudden outbreak or an endemic type of infection according to whether certain other factors are at play. While one can hardly expect to eliminate infections entirely and produce the guaranteed " infection-free " animal, one can at least effect some degree of control over a disease-producing agent. The exact degree to which an agent is controllable will depend ultimately upon the extent of our knowledge of those of its properties we may class as epidemiological. How does the agent enter the colony? How does it spread in the colony? Does it persist in the colony, or does it die out? The unit for study in the case of laboratory mouse infections may well prove to be the colony rather than the individual mouse.

The presence of an overt infection in a mouse colony is very often, but by no means always, a reflection of the standards of hygiene within that establishment. Tyzzer's disease is frequently found in colonies which by normal standards would be considered models of hygiene, but on the other hand there exists colonies which can regularly supply *Salmonella* carriers.

Should a mouse user find his animals infected with some agent he will most probably blame the breeder and claim that the mice sent to him were latent carriers. This is frequently true, but the animal house in which the experimental animals are being held is just as liable to provide a source of infection, especially if the animals are held for a long time. The breeder is always accused of being the source of infection (and this does not apply exclusively to commercial breeders) but laboratories themselves are not always blameless.

TABLE I

DISEASE IN BRITISH MOUSE COLONIES

Disease		Number of colonies reporting its presence
Viral	—M.H.V.	1
	Nigg's pneumonitis	1
	Ectromelia	11
Bacterial	—Salmonellosis	7
	Streptobacillus moniliformis	5
	Proteus spp.	2
	Erysipelothrix spp.	1
Others	—" Mouse Catarrh "	6
	Tyzzer's disease	10
	Infantile diarrhoea	8
	Jaundice	1
Nematodes	—(various)	5
Fungal	—*Trychophyton* spp.	6
Protozoan	—*Klossiella* spp.	1
	Sarcosporidia	1
	Eimeria spp.	1
	Endamoeba spp.	1
Mites		7
Cockroaches		3
Bed bugs		1

The most complete account of infections of laboratory mice is that by Dingle (1941) where he reviews some two dozen bacterial, viral and fungal diseases. Heston, in another chapter of the same book, reviews a number of protozoan, nematode and arthropod infections, but this is almost certainly an incomplete account of all the diseases which have been reported in laboratory mice. However, it is quite obvious that the mouse has a very fair share of diseases, and 17 of these were discovered during the course of this survey. Fortunately, most of these were of minor importance, and only four gave any real concern to a number of colonies. In Table I are listed the infections found in a survey of 30 British mouse colonies early in 1955, together with the number of colonies in which each had been noted. The relative importance of some of these infections is illustrated in Table II. Each disease recorded by a colony has been scored in accordance with the following standards:—

(1) Minor problem in the past (1953 or earlier), no longer encountered. score—00

(2) Major problem in the past, no longer encountered. score—0

(3) Minor problem—causing no real interruption of work or loss in production. Special culling is not needed, although the infection is known to be present. score—1

(4) The infection is believed to be present but, if so, is only a minor problem. score—1[1]

(5) Small outbreaks of infection, which are effectively controlled by prompt culling. Losses of this type cause only a small, more or less sustainable, drop in production. score—2

(6) Losses occur at irregular intervals during the course of work and larger groups may need to be used; or, regular small losses in production. score—3

(7) Major problem—losses are likely completely to annul certain experiments; or, the production rate is significantly lowered. score—4

This Table is to be considered only as an approximate guide to the mouse infection problem, and really illustrates the relative concern felt by the mouse breeders and users for the mice within each colony. It is not a good guide to the general quality of the mice bred or used in a given colony, because there is no common standard by which the observations of workers in different colonies may be judged. Commercial breeder No. 15, for example, scores a total of 10, compared with 3, 2, and 0 of the other three breeders in this class. The reason is that this breeder is more aware of the problem of infection than the other three; it is not that his mice are that much worse—they are, in fact, among the better quality commercial mice. The records of infections in a given colony are also directly related to the purposes for which the mice were used. For example, one research worker studying virus problems was well aware of the fact that his mice carried Nigg's pneumonitis virus (Nigg & Eaton, 1954) but almost all the other users of mice, because they had no work on hand with viruses, barely knew of the existence of this infection, or if they did, they paid it very little attention. Yet this virus is almost certainly

TABLE II
LOSSES AMONG LABORATORY MICE

Colony number	Infantile diarrhoea	Salmonella	Ectromelia	Tyzzer's disease	*Str. moniliformis*	"Mouse catarrh"	Ring-worm	Mites	Nematodes	Number of infections recorded	Total score
User-breeders											
1a and 1b	4	—	—	1	—	—	—	2	—	3	7
2 ...	—	—	—	3	—	—	—	2	—	2	5
5 ...	—	4	—	—	—	—	—	—	—	1	4
8 ...	4	1	—	1	—	—	—	—	—	3	6
9a ...	—	—	—	1[1]	—	—	—	2	1	3	4
10 ...	4	—	0	—	2	—	—	—	1	4	7
11 ...	—	—	1	—	—	2	—	—	—	2	3
12b ...	—	—	—	—	—	—	—	2	—	1	2
21 ...	4	1[1]	1[1]	—	—	—	3	2	—	5	11
24 ...	4	1	—	—	—	—	—	—	—	2	5
25 ...	3	—	—	—	—	—	—	2	—	2	5
27 ...	—	—	00	—	—	—	—	—	—	1	0
29 ...	—	—	—	—	—	—	—	—	—	0	0
Users											
4 ...	—	—	—	—	—	—	1	—	1	2	2
7 ...	—	—	—	—	—	—	—	—	—	0	0
9b ...	—	2	—	—	2	—	—	—	—	2	4
12a ...	—	3	4	1	—	—	—	—	1	4	9
18 ...	—	—	—	—	—	—	—	—	—	0	0
20 ...	—	—	—	—	—	—	—	—	—	0	0
22 ...	—	1	—	—	2	2	1	—	—	4	6
23 ...	—	—	1[1]	—	—	—	—	—	—	1	1
26 ...	—	—	0	0	—	—	00	—	—	3	0
28 ...	—	—	1[1]	—	—	—	1	—	—	2	2
50 ...	—	—	—	0	—	—	—	1	—	2	1
Commercial											
13 ...	1[1]	—	—	—	—	2	—	—	—	2	3
14 ...	—	—	—	—	—	2	—	—	—	1	2
15 ...	4	0	1[1]	—	2	2	1	—	00	7	10
16 ...	—	—	—	—	—	—	—	—	—	0	0
Cancer											
6 ...	—	—	1	2	2	—	—	—	—	3	5
19 ...	—	—	1[1]	—	—	—	—	—	—	1	1
3 ...	—	—	—	—	—	—	—	—	—	0	0
Number of records	8	8	11	8	5	5	6	7	5	63	—
Total score	28	13	11	9	10	10	7	13	4	—	105

present in all mouse stocks in the country. Again one colony, accustomed to working with protozoa, had found *Eimeria* spp. in some of the mice they bought; yet a second colony, using mice from the same source, had certainly never recorded the presence of these coccidia, and were unlikely to do so unless asked to look specially for them. Neither of these two colonies ever mentioned symptoms of Tyzzer's disease in their mice, and yet the colony providing them was almost certainly infected. The only mice in which *Erysipelothrix* spp. were found were those supplied to the veterinary division at one establishment, and this division was obviously accustomed to handling other members of this genus, derived from pigs.

Finally, there is one other factor affecting the observation of infection in various mouse colonies. On the average, the user-breeder colony will have its mice under observation for longer periods than the user colony; the mice are present from the time of birth to the time of use. Because of this, the chances for the detection of disease are greater, and this is more or less the case, even if one allows for the presence of infantile diarrhoea in the former group of colonies. Within the user colony group there will also be a distinction—not always very clear—between users of mice on long-term and short-term work. One research worker explained that he could use mice from one particular source because they were on experiment for less than two weeks. Had he wished to conduct long-term work, these mice would have been unsuitable, because ectromelia frequently broke out among them two weeks after receipt.

Four diseases are pre-eminent in British mouse colonies—infantile diarrhoea, ectromelia, salmonellosis and Tyzzer's disease. No infection of laboratory animals can be dismissed as of no importance, but all the others are relatively less important at the present time, and cause far less concern than these four. It is hoped to deal with each of these infections in turn in subsequent articles, but a brief résumé of the problem as a whole may not be out of place before the first infection is considered in detail.

At the present time, a repetition of the numbers of losses in various colonies due to each disease would have only a limited value, because far too few colonies conduct *post-mortem* examinations on dead or culled animals. Of those records which are available, some are lacking in important bacteriological data confirming the diagnosis. Nevertheless, it soon becomes

obvious which diseases are causing concern to the breeders and users of mice when visits to each colony are made. Losses due to infection may cause simply a drop in production, or may actually vitiate experimental results. A given infectious agent may exhibit its presence within a colony either by causing sudden epidemic outbreaks, or by assuming an endemic status; or it may be capable of assuming either rôle according to the epidemiological factors obtaining at the time. The presence of an infection in a colony, or mice sold from that colony, is very frequently a reflection of the standards of hygiene within that colony, but not invariably so. Experimentalists cannot always blame failure due to disease on their mouse supplier, though this is all too frequently the case. The types of infection identified within a group of mice are, unfortunately, frequently a reflection of the interests of the user of those mice. Finally, the finding of an infection within a group of mice is dependent upon the length of time for which they are observed.

Infantile Diarrhoea

Judged in terms of absolute numbers of mice dying or culled with infantile diarrhoea, this infection is probably the most important of all laboratory mouse disease at the present time. In another respect, however, it may be considered as less important than either ectromelia, Tyzzer's disease or salmonellosis. These infections all occur in adult mice, and under experimental conditions it is possible to light up latent infection which can ruin the work on hand. With infantile diarrhoea, however, there is no evidence at present that one can light up any kind of latent infection in adult mice. Laboratories using very young mice for certain types of research work (*e.g.* with the Coxsackie group of agents) might do well to bear this infection in mind, however.

Very little is known about this disease, partly because it has only recently aroused interest among mouse breeders, partly because it offers peculiar difficulties to experimental study, and partly because the study of natural diseases of laboratory animals in general has in the past been sadly neglected. The disease would appear to have been absent from this country in 1952 since there is no mention of it at all in the survey made by the Laboratory Animals Bureau (Lane-Petter, Barber & King, 1955), but this is most unlikely to be the true explanation. A very large number of mouse-breeding units are still at the present time (July, 1955) unfamiliar with this disease and, even if it were present within their colonies, would probably regard it not as a troublesome entity in its own right, but as an inevitable hazard of young mice. Before 1952 (or probably somewhat later than this) it is more than likely that few people realised that there was a fairly characteristic syndrome of this kind. Awareness of the problem in Britain now is probably due to the growing interchange of ideas which is taking place between American and British users and breeders of laboratory animals. The Americans have been greatly concerned with this problem for some time, but so far only five publications, all from America, have been concerned with this disease. Four of these derive from the same laboratory.

The Natural Disease

Cheever & Mueller (1947) describe this infection as a " new " disease, which spread rapidly throughout their mouse colony. The disease usually appeared in young mice between the ages of 10 and 15 days, and was chiefly recognised by the presence of diarrhoea in the affected young. The severity of the diarrhoea varied from the passage of large amounts of yellowish watery material extensively soiling the mouse to a very mild condition only recognisable by the adherence of faecal material to the underside of the tail. If the more severely infected mice survived the first two days of infection the faeces became dark, and obstipation, usually ending fatally, was frequent. In those mice which began to recover, perianal necrosis and sloughing was common. Complete recovery in mild cases occurred in two to five days, but severe cases, if recovery was to occur at all, took longer, and such mice were frequently retarded in growth. The outcome for any one litter could vary between 100 per cent. recovery and 100 per cent. death.

In one of their rooms it soon became obvious to Cheever and Mueller that infection was most severe and most frequent in first litters, and finally the stage was reached where useful breeding could be continued only if the loss of the first litter was regarded as inevitable, and actual production of animals was considered to begin with the second litter. Another colony, in a second room, set up a month after the first, was also infected after some time, but here the tendency for the first litters to be most severely infected was less marked. Some transmission experiments conducted by these authors, although not conclusive, again seemed to illustrate a marked susceptibility on the part of first litters.

Pathology and Aetiology

The second paper in the American series described a possible aetiological agent (Pappenheimer & Enders, 1947). Two types of intranuclear inclusions were found in the intestinal epithelial cells of 75 per cent. of a batch of young mice suffering from typical infantile diarrhoea. These inclusions occurred only between 10 and 15 days of age, and were most readily found in the early stages of the disease. They were seen in the epithelial cells at the summit of the villi of the small intestine. Type I inclusions were spherical, with a diameter of 1 to 4 μ, strongly refractile, eosinophilic and very often surrounded by a clear halo. There was usually only one per nucleus, though as many as five were occasionally seen. Type II inclusions were more diffuse and granular in character, and caused enlargement of the nucleus, more or less completely filling it, and caused a margination of the chromatin. The exact relationship between these two types was not clear, but it seems that they may have been different forms of the same agent, and both were always found in the same animal. The cells containing the inclusions were apparently exfoliated into the lumen of the gut, and this process ran parallel to recovery—when the mouse was fully recovered, no inclusion bodies were found.

An intracytoplasmic inclusion body was also found by these workers, but it appeared to have no aetiological significance.

Further experimental work on this colony was prevented by an accident which destroyed almost the entire stock. A new colony of four strains of mice was formed, and further study of the infection was begun. The four strains were Harvard (derived from nine survivors of the original stock), Schwentker, CFW (Carworth Farms), and C (National Cancer Institute). The influence on incidence of strain, litter and season, was studied with these strains (Cheever & Mueller, 1948). It was found that significant strain differences were limited to the CFW mice, which persistently weaned a lower percentage than the others. The first litters in all four strains fared worse than later litters, and the only signs of a seasonal influence were shown by the CFW mice, which had a higher death rate in autumn and early winter. The aetiology of this second outbreak was investigated by Pappenheimer & Cheever (1948). The intranuclear inclusions were not found this time —instead, cytoplasmic inclusions were seen, which were unmistakably different from both the intracytoplasmic and the intranuclear inclusions seen before. These new inclusions were spherical, with sharp outlines, and measured 1 to 4 μ in diameter. They occurred singly in most cases, but occasionally several were found within the same cell. Infected cells were only seen at the summit of the villi, never at the base, and these cells again appeared to be exfoliated coincidentally with recovery. The inclusions occurred in 57 per cent. of a batch of naturally infected young, and in 80 per cent. of a batch experimentally infected.

Syverton & Olitsky (1934) described an epidemic of diarrhoea in young unweaned mice, which appeared to be due to a *Salmonella* sp. Superficially, this outbreak appeared to be similar to that described above, but it was almost certainly of a different aetiological nature. *Salmonella* spp. were never once isolated by the American authors, and the two infections differ in other details.

Epidemiology

Runner & Palm (1953) made a study of the factors associated with the incidence of this disease in a colony of C3H mice over a four-month period. Over 900 mice were born during this period, from 76 pairs. Thirty-seven pairs gave birth to 62 litters (350 young), none of which showed signs of the disease. The other 39 pairs had 92 litters (550 young), of which 46 showed diarrhoea and were destroyed. The overall incidence was about 30 per cent. of the young born. In summary, they found that large litters of early parities, from young parents, showed a tendency to a higher incidence of infection. They also considered that there was some indication of a seasonal influence on incidence, but the four-month observation period was probably too short for this view to be accepted without reservation.

The Natural Disease in British Mouse Colonies

Eight colonies in Great Britain, including two commercial breeders, have described the presence of an infection which may well be that described above. The descriptions given by four of these colonies may be relied upon to be fairly accurate, and there is no reason to suppose that the observations of the other two are much less reliable. Leaving aside the commercial colonies, it was quite obvious that infantile diarrhoea was a major concern to at least six large mouse-breeding establishments.

The symptoms described by the various persons in charge of the infected colonies coincided very well with those of Cheever and Mueller, although they were not so complete, and in no case had microscopical observations been made. Two colonies did not keep very detailed records, and were unable to say whether the first litters were more prone to infection than later litters. Three colonies described a very definite tendency for first litters to be severely infected, and one user-breeder colony (No. 21), while describing a high first litter incidence, also described a moderately high incidence in later litters.

Commercial breeder No. 15 had noted the presence of an infection of this type in his colony, but was of opinion that he could control it effectively. He had observed that primiparous females frequently showed a curious damp appearance of the coat one or two days before their young developed the typical diarrhoeal signs. He found that if, as soon as this sign was noted, he stopped feeding his mice the normal wet mash and gave only dry oats (*i.e.* no water at all), and kept to this oats diet for three days, he very rarely lost any young, due to diarrhoea from such a doe. His treatment is entirely empirical, but he is satisfied of its success. One other colony (No. 10) had also noticed this curious dampness of the female's coat which very often heralded the infection of her litter. The dampness was of very short duration, and had not been noticed by any other colony, and is not described by the American workers. Careful observation on the part of infected colonies should help to determine whether this is a characteristic sign of infection.

Breeder No. 15 had also exchanged an infected first litter with an uninfected litter from a mother whose three previous litters had shown no sign of disease. The fourth litter being nursed by the first litter mother became infected, a result which fits the general pattern of the American work. Yet another colony (No. 1A) had tried similar experiments with no success.

Only one other colony (No. 21) had attempted any special observation on this disease (Sellar & Hogg, 1955). This colony bred a total of about 2,000 mice each week, most of which were an albino strain, but a few were grey (known as " L.A.B. Grey "). Most of their stock were held in one large room, and this section was known to be badly infected. A small, separate room was set aside in which it was proposed to breed both grey and white mice on a comparative productivity trial. At first these experiments were successful, but eventually infantile diarrhoea appeared, in the third litters of the grey mice. These mice were bred by a monogamous pairs system, and the average litter sizes at birth were: first litter, 5.9; second litter, 7.65; third litter, 8.1; and the respective weaning rates were 91.2, 81, and 22 per cent. The loss due to the diarrhoea is obvious. Breeding from these pairs was continued to the seventh litter; after

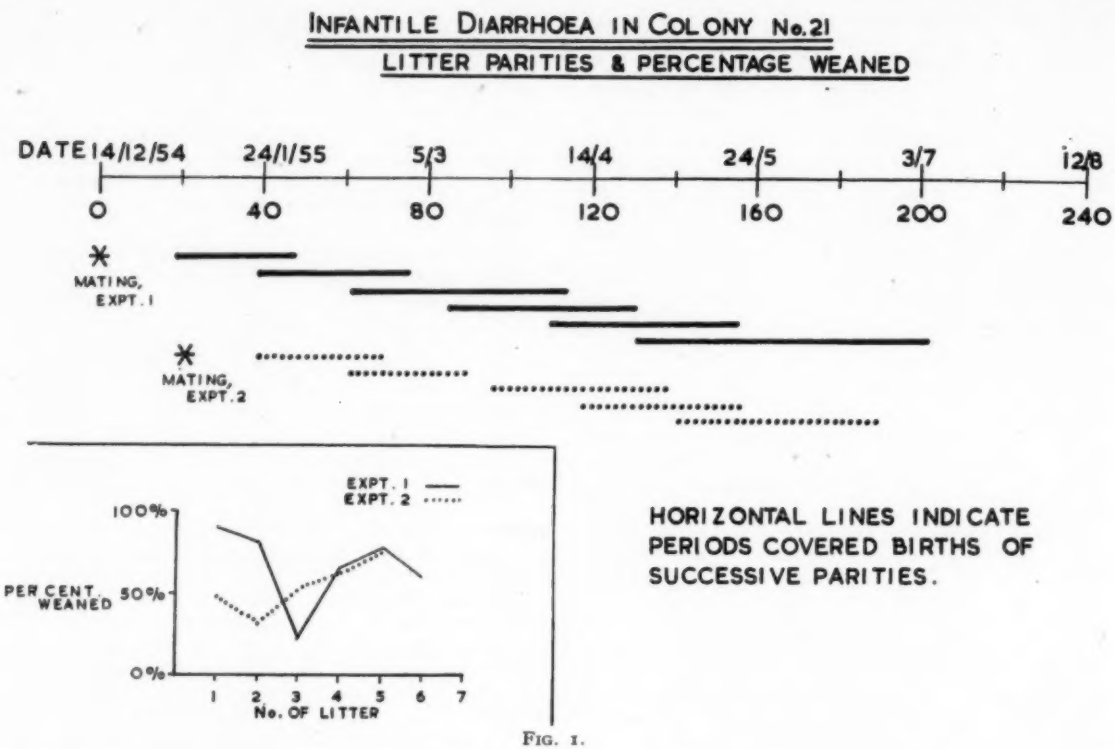

FIG. 1.

the third, the weaning rate began to climb again. A second breeding experiment with the grey mice was begun at such a time that the period covering the birth of the first litters of this new batch of females was co-extensive with the period of birth of the second litters of the first batch of females; but the weaning rate this time was only 50 per cent. (average litter size 4.2). The second litters of this batch showed a weaning rate of 33 per cent., but the third litters weaned 54 per cent. and the fourth litters, 62.9 per cent. Fig. 1 shows the time relationships covered by the births of successive parities in each of these experiments, and the percentage weaned in each of these parities. These results would suggest that the only reason that there is greater incidence of this disease among first litters in most colonies is that they are the first litters to be exposed to infection. In these experiments, the infective agent did not gain access to the breeding room until some time during the period in which the second litters of the first batch were being nursed. The first litters to be really exposed were the third litters. The apparent correlation between incidence and parity and parental age found by Runner and Palm might be due to the fact that, in an ordinary breeding colony, first litters are always born by young parents.

The high death-rate among first litters in the main production section of this colony (No. 21) is shown in Fig. 2. The weaning rate for first litters was persistently below that of subsequent litters, and this quite obviously indicates a considerable loss to a colony producing about 2,000 mice a week.

Colony No. 1A has conducted some experiments (unpublished) to determine the influence of diet on the incidence of this disease. The results were entirely negative. The observations made by colony No. 21 on this question are of interest, but are not readily explicable at present. From October 8th, 1951, the monthly percentage of mice weaned has been recorded, and these figures are shown in the form of a histogram in Fig. 3. For the first half of this period, the standard feed given was a dough mixed on the premises and containing flour, milk, yeast and mineral salts. At the end of this period a change was made to diet 41 cubes, since when there has been a distinct increase in the infantile diarrhoea death-rate, as shown by the drop in percentage weaned. One can at present offer no explanation of this, and its significance is unknown.

Discussion

The question of intercurrent infection in laboratory mice in Great Britain at the present time is one of extreme importance to both breeder and user. The value of the disease-free animal needs no emphasis, yet it is equally obvious that mouse quality, in this respect, is below what it can and should be. The reasons for this are complicated and various, yet *in toto* they amount to the fact that insufficient attention is given to mouse health and hygiene in most colonies. *Post-mortem* examinations and practical disease control methods are too few or insufficiently thorough.

Four diseases are of major importance to-day, of which infantile diarrhoea probably accounts for the

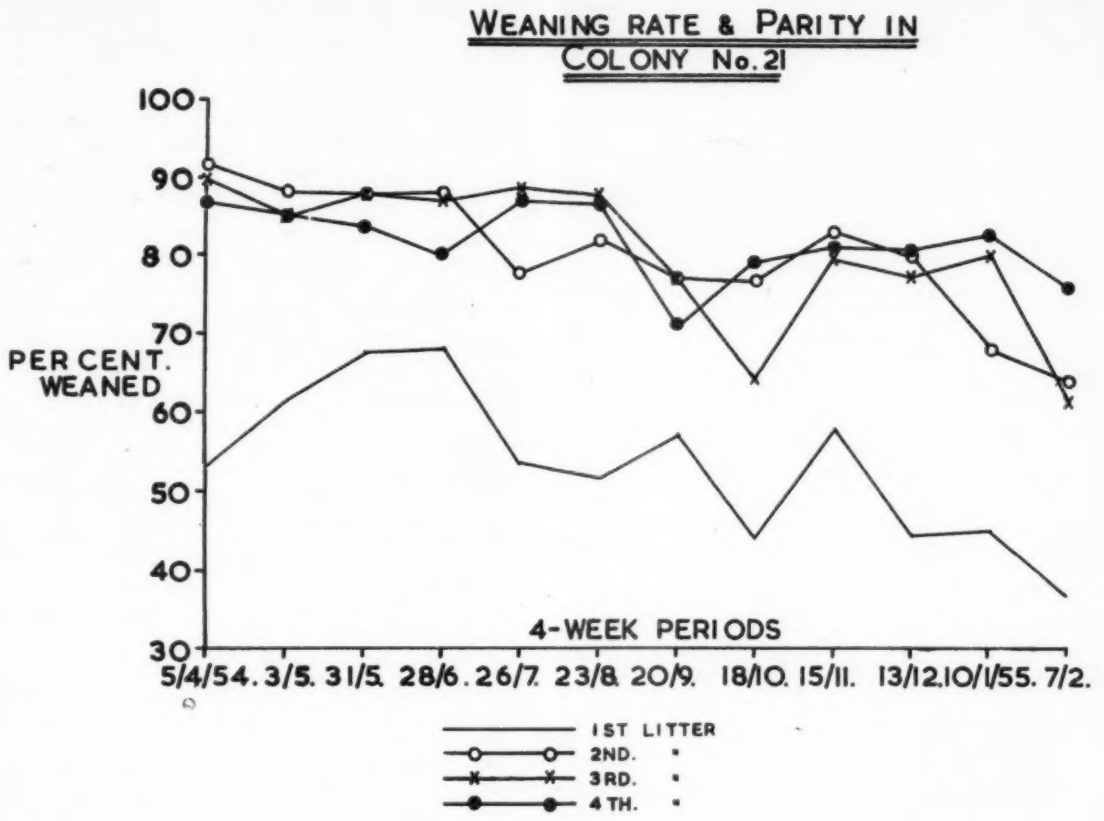
WEANING RATE & PARITY IN
COLONY No. 21
100
90
80
70
60
50
40
30
PER CENT. WEANED
4-WEEK PERIODS
5/4/54. 3/5. 31/5. 28/6. 26/7. 23/8. 20/9. 18/10. 15/11. 13/12. 10/1/55. 7/2.
1ST LITTER
2ND. "
3RD. "
4TH. "

FIG. 2.

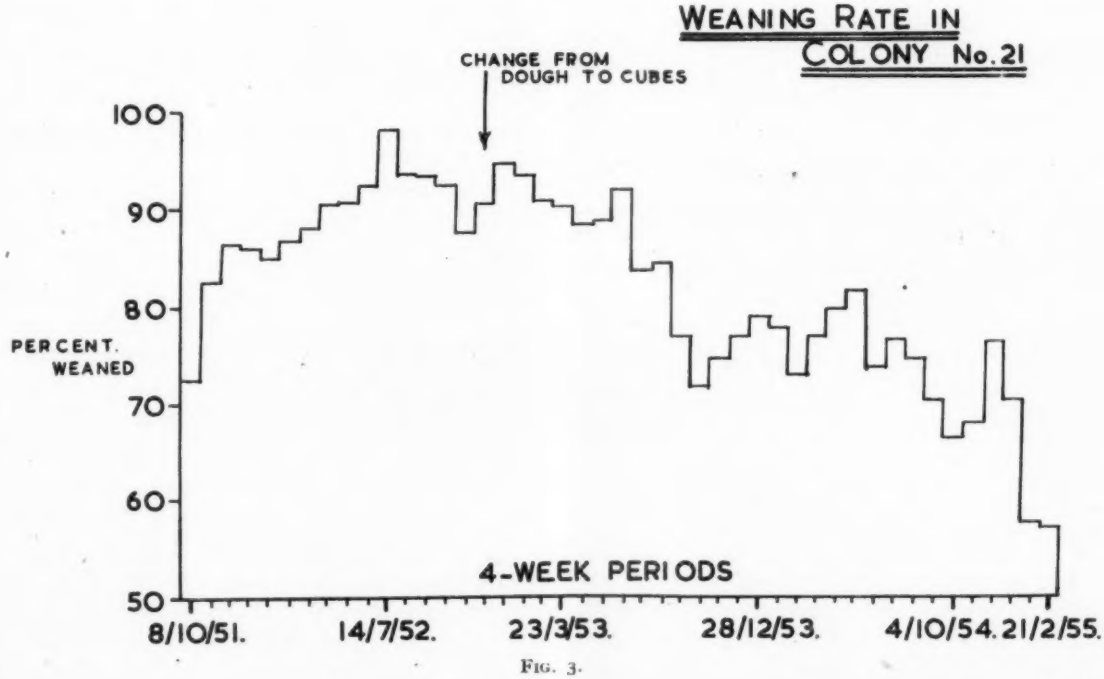
WEANING RATE IN
COLONY No. 21
CHANGE FROM DOUGH TO CUBES
100
90
80
70
60
50
PER CENT. WEANED
4-WEEK PERIODS
8/10/51.
14/7/52.
23/3/53.
28/12/53.
4/10/54.
21/2/55.

FIG. 3.

greatest losses in absolute numbers. It is probably unrecognised in a number of colonies, or is not regarded as a contagious disease capable of causing considerable loss. As yet very little is known about this infection.

Summary

Infantile diarrhoea of mice occurs fairly widely among mouse colonies in Great Britain. Wherever it does occur it is sufficiently widespread to cause an appreciable drop in the production rate of a colony. It does not appear to cause concern in other ways, such as interfering with the experimental use of adult mice. In clinical signs and epidemiology, the disease in this country corresponds closely to the American descriptions. Its aetiological nature is still not established, and could be multiple. Diet may affect the incidence of the disease. Seasonal influences have yet to be unequivocally demonstrated. There is in most outbreaks a markedly high incidence in first litters, but this may be fortuitous and imply no special susceptibility on the part of these litters. It appears that there is an increase in immunity to infection (or some other immunological change) on the part of the female mouse after at least one of her litters has shown signs of infection, resulting in a decreased infection rate of subsequent litters. Specific control measures are unknown.

Acknowledgment.—I should like to thank all those who co-operated in this survey, and particularly Mr. G. A. Stewart, of Burroughs Wellcome Co., Control Laboratories, Dartford.

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TUFFERY, A. A. (1956). (In press.)

TRAVELLING BLACKSMITHS IN THE U.S.A.

It is reported in the press that technical schools and colleges in the United States—among them being the veterinary school of Cornell University—are giving special courses to intending blacksmiths. Special craftsmen are being called for in increasing numbers to shoe race-horses and hunters; while on farms, notwithstanding the increase of mechanisation, there is still plenty for the smith to do. The up-to-date American smith takes his forge and tools on a lorry from farm to farm and does, it is said, a thriving trade.

Current Literature

ABSTRACTS

Effects of an Outbreak of Avian Encephalomyelitis (Epidemic Tremor) in a Breeding Flock. TAYLOR, W. L., *et al.* (1955). *Poult. Sci.* **34.** 1036-45.

The authors describe an outbreak of epidemic tremor in chicks within a self-contained breeding flock. Examination of the records showed that about three-quarters of the hens had recently shown a decrease in the rate of lay or had ceased laying for a period of three or more days. Eggs produced just before and during this period of depressed egg production showed a lowered hatchability and an increased embryonic mortality, and the virus of epidemic tremor was recovered from the chicks hatched from them. The eggs laid after the period of depressed production showed a hatchability returning to the normal level. The chicks produced from these eggs showed no evidence of epidemic tremor.

The authors suggest that eggs produced for some days previous to a sharp decline in egg production should not be used for hatching purposes. They state that they have found no previous reference to this effect of epidemic tremor infection on egg production and hatchability.

The Incidence of *Salmonella pullorum* in Wild Pheasants in Southern Michigan. BELDING, R. C. (1955). *Poult. Sci.* **34.** 1441-4.

The author reports the isolation of *S. pullorum* from five out of 65 (7.7 per cent.) apparently healthy wild pheasants collected from various parts of Southern Michigan. No other salmonella types were recovered. The examination of 36 pheasant eggs gave negative results. It appears that wild pheasants are a potential source of pullorum disease (B.W.D.) in domestic poultry kept on free range.

Dry Feeding of Calves. PRESTON, T. R. (1956). *Agric. Lond.* **62.** 462.

The author points out that one-third of the total cost of rearing calves from birth to first calving is accounted for by the cost of the whole milk, milk substitutes and calf meals used during the first four months of life. Thus any economy effected during these first four months could considerably reduce the cost of herd replacements. Milk substitutes are of limited use in this respect since most are based on dried milk products and are, therefore, expensive. The author therefore studied the possibility of hastening the development of ruminal function so that calves could be fed entirely on roughage and simple grain mixtures from the third or fourth week.

In a preliminary experiment, three Ayrshire calves were weaned abruptly at 24 days old. Another three calves were given the same quantity of milk, but were weaned gradually from the 10th to 31st day. Both groups were offered a meal mixture, containing aureomycin, from the 10th day onwards. Hay was offered at 17 days. Both groups showed a good rate

of liveweight gain, with very little check at weaning. There was a considerable saving in feeding costs.

The author considers these preliminary findings very encouraging, but he suggests that these methods should not be recommended for general use until further experiments have been completed.

The Role of the Infected Egg in Transmission of Visceral Lymphomatosis. BURMASTER, B. R., & WATERS, N. E. (1955). *Poult. Sci.* **34.** 1415-29.

When the eggs from 16 hens were hatched and brooded in strict isolation (*i.e.*, as 16 separate batches) it was found that there was no significant difference in the incidence of visceral lymphomatosis (V.L.) between the progeny of hens known to be excreting the virus of V.L. in their eggs and those of hens not excreting the virus in this way. In a second experiment, eggs from susceptible but V.L.-free hens were hatched in the same incubator as the eggs from infected hens, and the resulting chicks were reared together. The results indicated that a high rate of transmission occurred during the brooding period, but not during the hatching period. Similarly, the incidence of V.L. was not increased when preparations of the V.L. virus were introduced into an incubator during the hatching period.

The authors suggest that infected hens transfer sufficient antibody to their eggs to protect the embryo and chick against the virus infection. These infected chicks may, however, transmit the disease to chicks from non-infected hens (*i.e.*, chicks that have not received protective antibodies). They suggest that most of this transmission occurs in the brooding period rather than in the incubator.

E.A.G.

Studies on Arthritis in Swine. (1) Experimental Erysipelas and Chronic Arthritis in Swine. (2) The Effects of Hormone Therapy on Advanced Chronic Polyarthritis Experimentally Induced by Erysipelothrix Infections. SIKES, D., NEHER, G. M., & DOYLE, L. P. (1955). *Amer. J. Vet. Res.* **16.** 349-66, 367-73.

The difficulty of reproducing swine erysipelas by the artificial inoculation of *Erysipelothrix rhusiopathiae* has always been an obstacle in experimental studies of the disease. For this reason Doyle's observation (Doyle, 1947) that pigs could more readily be infected by intracerebral inoculation of *E. rhusiopathiae* if they had previously been injected with swine fever crystal violet vaccine aroused considerable interest. A further method of producing experimental erysipelas is now reported. It appears to depend partly on using pigs from herds known to be free of erysipelas and partly on the use of a particular strain of the organism, maintained in a serum semi-solid medium; previous inoculation with crystal violet vaccine is unnecessary.

Following a single intravenous, intradermal or intra-articular injection of this strain, some pigs contracted acute erysipelas, some developed chronic joint or heart lesions and some resisted infection, a pattern similar to that seen in natural outbreaks of the disease. The intra-articular route proved the most effective, and it was found that joints other than the one injected would frequently develop lesions.

This technique has enabled a study of the pathology of the experimental disease to be made. In acute cases the total leucocyte count was reduced, sometimes to one-third of its original value, although there was a marked absolute monocytosis; these blood changes were most pronounced during or shortly after the period of maximum pyrexia. Among other histological features, that of the skin lesions is described; the urticarial type of lesion was characterised by oedema and by capillary haemorrhage and thrombosis in the papillary layers of the skin. In the erythematous lesions which accompanied the acute, septicaemic form of the disease, engorgement and haemorrhages occurred in the papillary and subpapillary layers, with round cell foci and areas of necrosis; such lesions tended to become gangrenous if the animal survived.

Arthritis occurred most commonly in the carpal and tarsal joints. At first there was vascular engorgement of the capsule and villi, with a non-purulent effusion into the joint cavity. By the second month the villi were hypertrophied and densely infiltrated with lymphocytes, and by the sixth month they resembled granulomatous polypi. Fibrous ankylosis occurred in advanced cases, and radiographs showed osteophyte formation.

Sometimes the arthritic cases recovered spontaneously, but more often the joint lesions persisted indefinitely with alternate periods of exacerbation and remission. By the fifth month after infection, however, the organism had usually disappeared from the diseased joints, supporting perhaps the view that under certain conditions these synovial granulations may assume some of the properties of a benign neoplasm.

The most constant visceral changes noted in advanced polyarthritis cases occurred in the kidneys (fibrosis) and in the adrenal glands. The zona glomerulosa of the adrenal cortex tended to be atrophied, though the adrenal glands themselves were usually enlarged.

Cortisone (75 mg. daily for four weeks with reduced doses for a further fortnight) produced marked clinical improvement in advanced arthritis cases. (The present report does not state whether improvement was maintained after withdrawal of treatment; in earlier experiments however (Doyle, Andrews & Hutchings, 1950) it was not.) ACTH treatment produced no improvement, and on withdrawal the symptoms became much worse. No doubt these effects are related in some way to the changes described in the adrenal cortex and perhaps the kidney; the authors suggest that severe renal and adrenocortical damage may explain the failure of ACTH to produce improvement, and that in such cases adrenal rest (cortisone) rather than adrenal stimulation (ACTH) is indicated.

J.E.S.

References

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News and Comment

THE PRESIDENT AT THE LYONS VETERINARY SCHOOL

The President and Mrs. Wilkinson returned recently from a journey to France, where they represented the Association at a notable ceremony which took place at the Ecole Nationale Veterinaire de Lyon, the world's oldest veterinary school. The occasion was the unveiling of a new statue of Claude Bourgelat who founded the School in 1763 and who, incidentally, at the command of Louis XVI, founded the Belfort School in the suburbs of Paris two or three years later.

The original statue of Claude Bourgelat cast in bronze had been seized by the Germans during the second world war; the new statue is of stone, and is erected in the Cour d'Honneur of the School.

The guest of honour at the unveiling ceremony was M. Edouard Herriot, the famous ex-Premier of France. Afterwards Mr. Wilkinson was an honoured guest at a civic luncheon, while Mrs. Wilkinson was the guest of that very active body, Les Femmes des Veterinaires Francais at the School.

During the visit many friendly contacts were made with our French colleagues, and the President extended an invitation for return visits during this year's Congress.

With regard to the Lyons School it is interesting to recall that the founder of the Royal Veterinary College in London, Charles Vial St. Bel, was a student there.

UNIVERSITY NEWS

London

R.C.V.S. THIRD EXAMINATION

Pathology only

Byrne, G. A.; Chaudhari, A. Q.; Davison, R. S.; Hughes, J. R.; Hussain, S.; Jones, W. A.; Patil, R. F.; Savvides, J. S. (credit); Stocks, B. M.; Tripathy, G. D.; Wilkinson, John.

FINAL EXAMINATION

Barnett, K. C.; Blackmore, D. K.; Blaxland, D. R.; Bruford, J. C.; Butler, B. C.; Chappell, L. A.; Clark-Lewis, A. V.; Cook, W. E. R.; Edgar, R. K.; Gee, R. E.; Girling, Miss M. J.; Hime, J. M.; Hollands, J. G.; Irfan, M.; Lawrence, B. T.; Mason, J. A.; Mehrotra, P. N.; Mittal, V. P.; Mullen, P. A.; Nelson, E. P.; Newey, R. M.; Noordin Keling, M.; Oke, M. A.; Owen, Geoffrey; Parkinson, K. D.; Prasad, A. K.; Ranger, M. J.; Stevens, H. R.; Teale, M. L. (credit in medicine); Terlecki, S.; Thorp, A. C. B.

Liverpool

DEGREE OF BACHELOR OF VETERINARY SCIENCE

First Examination, Part I (Chemistry)

Allen, W. M.; Carding, A. H.; Davies, J. O.; Dawkes, B. H.; Evans, W. E. S.; Fell, C.; Green, P. B.; Gyening, E. O.; Hardy, B. D .W.; Hopkins, D. L.; Jones, G. W.; Jones, R. M.; Jones, R. S.; Milner, N. A.; Peel, D. R.; Proudlove, A. J.; Rigby, J. P.; Shreeve, B. J.; Taylor, K. C.; Thomas, J. K.; Vaughan, A.; Walker, D.; Walker, D. E.; Zagni, P. A.

Part II (Physics)

*Allen, W. M.; Carding, A. H.; Davies, J. O.; Dawkes, B. H.; Evans, W. E. S.; Fell, C.; Green, P. B.; *Gyening, E. O.; Hardy, B. D. W.; *Hopkins, D. L.; Hudson, R. H.; Hughes, Margaret; Jones, G. W.; *Jones, R. M.; Jones, R. S.; *Milner, N. A.; Nairn, A. D.; Peel, D. R.; Proctor, G.; Proudlove, A. J.; Rigby, J. P.; Shreeve, B. J.; *Taylor, K. C.; Thomas, J. K.; Thomson, Judith A.; Vaughan, A.; Walker, D.; Walker, D. E.; Westbrook, R.; *Zagni, P. A.

* Passed with distinction.

Part III (Botany)

Allen, W. M.; Carding, A. H;. Davies, J. O.; Dawkes, B. H.; Evans, W. E. S.; Fell, C.; Green, P. B.; Gyening, E. O.; Hardy, B. D. W.; Hopkins, D. L.; Hudson, R. H.; Hughes, Margaret; Jones, G. W.; Jones, R. M.; Jones, R. S.; Milner, N. A.; Nairn, A. D.; Peel, D. R.; Proctor, G.; Proudlove, A. J.; Rigby, J. P.; Shreeve, B. J.; Taylor, K. C.; Thomas, J. K.; Thomson, Judith A.; Vaughan, A.; Walker, D.; Walker, D. E.; Westbrook, R.; Zagni, P. A.

Part IV (Zoology)

Allen, W. M.; Carding, A. H.; Davies, J. O.; Dawkes, B. H.; Evans, W. E. S.; Fell, C.; Gyening, E. O.; Hardy, B. D. W.; Hopkins, D. L.; Hudson, R. H.; Hughes, Margaret; Jones, G. W.; Jones, R. M.; Jones, R. S.; Milner, N. A.; Nairn, A. D.; Peel, D. R.; Proctor, G.; Proudlove, A. J.; Rigby, J. P.; Shreeve, B. J.; Taylor, K. C.; Thomas, J. K.; Thomson, Judith A.; Vaughan, A.; Walker, D.; Walker, D. E.; Zagni, P. A.

Second Examination, Part I, Veterinary Anatomy (including Histology and Embryology)

Moody, Enid; Neil, D. H.

Part II, Physiology (including Biochemistry)

Davies, H. S.; Hamilton, J. G.; Moody, Enid; Neil, D. H.

Third Examination, Part I (Pharmacology)

Barr, D. A.; Batt, R. A. L.; Bryan, N. M.; Death, R. W. J.; Ducker, M. C.; Edwards, J.; Francis, P. G.; Haywood, R. H.; Hilder, E. F.; Hothersall, Maureen; Ingman, N. R.; Janes, P. D.; Lloyd, Anne S.; Lloyd, R.; Mears, Hazel; Pearson, P. D.; Penhale, W. J.; Perry, K. T. E.; Robson, J.; Sulley, M. J.; Waterworth, J.

DEGREE OF B.V.SC. WITH HONOURS

Class II

†Dungworth, D. L.

† With distinction in Regional Veterinary Surgery and Obstetrics.

ORDINARY DEGREE OF B.V.Sc.

Barraclough, A. B.; Butler, Eileen J. M.; Coles, B. H.; Doran, G. P.; Dunwell, R. S.; Edwards, B. F.; Etheridge, M. F. N.; Evans, D. J.; Gibbons, C. W.; Langman, B. A. G.; Lowe, A. D.; Moss, B.; Roberts, R. G.; Schwarz, G.; Shepherd, M. J. W.; Sims, F. W.; Stevenson, D. E.; Struthers, Edith A.; Stuart, J. C.; Ward, R. K.; Watson, S. N.

Passed in Final Examination (Part II) only

Birks, Margaret.

Glasgow

FINAL PROFESSIONAL EXAMINATION

Kozorowski, Emil W., Beckenham, Kent; Patel, J. F., Nadiad, India; Taylor, C. M., Bombay, India.

Edinburgh

DEGREE OF BACHELOR OF VETERINARY MEDICINE AND SURGERY

Final Professional Examination (Part I), Veterinary Hygiene

Bradley, Anthony T.; Brown, Kenneth; Crawford, Samuel B.; Ingham, Brian; McCaskill, Hugh; McMartin, Duncan A.; Maxwell, Michael D.; Ricketts, John D.

PART II EXAMINATION, DIPLOMA IN TROPICAL VETERINARY MEDICINE

Campbell, Robin Johnston, B.SC., M.R.C.V.S.; Condy, John Beatty, M.R.C.V.S.; Ferguson, William, M.R.C.V.S. (Glasgow); Hague, Douglas Charles, M.R.C.V.S. (Liverpool); Hammond, John Arthur, M.R.C.V.S. (London), D.V.S.M.; Hardie, Henry, M.R.C.V.S.; Hazarika, Rabindra Nath, G.V.SC. (Bengal Veterinary College, Calcutta); Louisy, Greaham Eric, D.V.M. (Toronto); Mackie, Alexander Muir, M.R.C.V.S. (Glasgow); Pfob; Lewis Stanley, M.R.C.V.S. (Glasgow); Rashid, Ahmed, M.R.C.V.S.; Rennie, James Douglas, B.SC., M.R.C.V.S.; Renwick, Charles Campbell, M.R.C.V.S., and Tremlett, John Gerald, M.R.C.V.S.

THE LIVERPOOL UNIVERSITY FUND

A fund has been launched to raise £500,000 for additional buildings and equipment for the University of Liverpool. At a luncheon, Lord Leverhulme, Chairman of the organising committee of the appeal, announced that £342,000 had been received already. In the course of his speech he suggested that it was not in the best interest of any university that its work should be financed wholly out of public funds. The essential freedom of university life and teaching could be impaired by complete dependence upon the State.

Sir James Mountford, vice-Chancellor of the University, referring to the urgent needs of the university as a whole, mentioned specifically its " pioneer School of Veterinary Science."

THE SUPPLEMENT

A new issue of THE SUPPLEMENT will be going to press shortly and honorary secretaries of Divisions and others who have material to contribute are asked to be good enough to send their manuscript to the editor in the course of the coming week. Once this next Supplement is published we shall have caught up with the long and unfortunate time lag brought about by the printing dispute earlier this year.

Incidentally, it is a matter for satisfaction that for the skeleton issues produced during the dispute and which our readers received with so much goodwill, it was found possible to show a profit on publication.

IN PARLIAMENT

Artificial Insemination (*Vibrio foetus*)

MR. PEYTON (July 2nd) asked the Minister of Agriculture, Fisheries and Food if he is satisfied that *Vibrio foetus* cannot be spread by artificial insemination; and if he will make a statement.

MR. AMORY: No. It is not impossible for this disease to be spread by artificial insemination. All practicable steps are taken by my Department to ensure that only healthy bulls are approved and maintained in use at artificial insemination centres.

MR. PEYTON: While thanking my right hon. Friend for that reply, may I ask him whether he will invite the co-operation of the Milk Marketing Board to make quite certain that every possible effort which is compatible with our present state of scientific knowledge is made in order to prevent bulls which have this disease from being used for A.I. purposes?

MR. AMORY: I share my hon. Friend's views on the importance of this matter. I can assure him that the Milk Marketing Board is very alive to its importance, and, I believe, is doing everything possible in co-operation with my Department. I can assure him that we shall continue to have the closest possible co-operation with the Board to minimise the great damage which can be caused.

50 YEARS AGO

Our efforts to increase the amount of clinical material in this journal through the announcement of the William Hunting Awards and also by means of questionnaires which are being circulated to Divisions are meeting with some degree of success. Even so, readers still write from time to time suggesting that matters of purely scientific interest occupy an undue proportion of our space. Be this as it may, the following quotation from THE VETERINARY RECORD of July 7th, 1906, shows how firmly William Hunting was on the side of the clinician.

" The Board of Agriculture has issued this report (The Annual Report of the Veterinary Department, 1905) in its usual form—a review of the year's work by the Chief Veterinary Officer and by the Assistant Secretary. One is supposed to treat the matter from an ' administrative ' aspect. This division of labour represents the practice of the Board, and is analogous to having two commanding officers instead of one. In practice it works out about the same as though a clerk from the War Office had been on equal terms with Lord Kitchener in South Africa.

"What strikes us most in reading the Chief Veterinary Officer's report is the prominence given to pathology and bacteriology. So far as research goes this is right, but there are diseases about which a great deal is known, but for which legislation is at present almost useless. Clinical knowledge of disease is of at least equal value to pathological, and experience shows that those diseases which have been stamped out are those about which bacteriology has taught nothing whilst those which have not been controlled are those about which bacteriology has learned most."

SHEEP-DOG TRIALS SUCCESSES

Mr. A. McPhee, a member of the profession practising at Brampton, Cumberland, has twice recently won open sheep-dog trials with dogs bred by him for a hobby. In his latest victory he defeated the veteran sheep-dog trialist, Mr. John Johnstone, who numbers among his successes that at Hyde Park a few weeks ago.

COLONIAL AGRICULTURE

Statistics issued recently in the annual return of schemes under the Colonial Development & Welfare Acts show that during the year ended March 31st, 1956, sums amounting to £3,979,956 were approved for agricultural and veterinary schemes.

SUCCESSFUL BEGINNING TO THE "ROYAL"

The Royal Show, which opened in sunny weather on Tuesday of this week, drew its best first-day attendance since 1949. At 5 p.m. the number was 15,861, compared with 12,037 at the same time at Nottingham last year.

Newcastle, which is staging its seventh "Royal," has a one-day record attendance which, though established in 1908, has not been beaten. The number then was 98,489. This figure is unlikely to be beaten now, but an attendance of more than 150,000 over the four days is hoped for.

BEAUTY AND THE BEAST

We quote the following from a provincial newspaper:—

"In a specially equipped room adjoining the theatre, the hospital's attractive young anaesthetist—a veterinary surgeon with seven years' experience—finds them (the animals) model patients. In her skilful hands a lively Cairn terrier allowed himself to be anaesthetised without even a protesting bark."

Members of the other, homelier sex, will appreciate the apparent clinical advantage attaching to the *bien soigné*.

MR. WILLIAM KENDRICK

Mr. V. P. Mittal writes:—

I was fortunate enough to see some practice with Mr. Kendrick during the last Easter vacation. He welcomed an Indian student in his practice, and told me stories about the time he was in the Middle East during the 1914-18 war. From the day of my arrival he showed immense kindness to me and treated me as one of his family. He took keen interest in explaining cases to me, and the experience I gained with him proved to be of great practical value to me later. Even after I left him he wrote to me three times asking how I was getting on, and whether I was having any difficulty.

It is difficult for me to express my appreciation of him, and I shall remember this great gentleman for the whole of my life.

PERSONAL

Birth

BLOOMBERG.—On June 2nd, 1956, at Takaka Hospital, Golden Bay, New Zealand, to Patricia, wife of J. H. Bloomberg, M.R.C.V.S., a son, Mark.

COMING EVENTS

July

17th (Tues.). Summer Meeting of the Association of Veterinary Teachers and Research Workers (Northern Region) at The Evans Biological Laboratories, Runcorn, 11 a.m.

18th (Wed.) General Meeting of the Society of Practising Veterinary Surgeons, B.V.A., at the Queen Hotel, Chester, 2.15 p.m.

19th (Thurs.). Annual General Meeting of the Supplementary Veterinary Register Division, B.V.A., at 7, Mansfield Street, Portland Place, London, W.1, 2.30 p.m.

20th (Fri.). Summer Meeting of the Eastern Counties Division, B.V.A., at Cambridge, 11 a.m.

Summer Meeting of the Mid-West Division, B.V.A., at the Berkeley Café, Clifton, 2.30 p.m.

28th (Sat.). Annual reunion of the R.V.C. '52 Club at Ye Miller of Mansfield, Goring.

September

16th to 22nd (Sun. to Sat.). 74th B.V.A. Annual Congress at Royal Leamington Spa.

BRITISH VETERINARY ASSOCIATION QUARTERLY MEETINGS

Wednesday, July 11th, 1956—No. 7, Mansfield Street

10.30 a.m.—Organising Committee.
2.00 p.m.—Home Appointments Committee.
3.30 p.m.—Parliamentary and Public Relations Committee.

Thursday, July 12th, 1956—No. 7, Mansfield Street

10.00 a.m.—Veterinary State Medicine Committee.
12.30 p.m.—Finance Sub-committee.
2.15 p.m.—General Purposes and Finance Committee.

Friday, July 13th, 1956—Connaught Rooms

10.30 a.m.—Council Meeting.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Beds. Griffin Farm, Toddington, Dunstable (June 28).

Leics. Bank Farm, Ratcliffe Culey, Atherstone (June 25).

Montgomery. Upper Hall, Meifod (June 25).

Fowl Pest

Lancs. Bannister Green, Eccleston, Chorley (June 25); Drinkwater Farm, Brinscall, Chorley; Woodroofe Farm, Higher Wheelton, Chorley; Brook Dale, Chorley Road, Heath Charnock (June 27).

Lincs. Kirton Fen, Dogdyke; Burton Farm, Main Road, Leverton, Boston; Ferndale, Fiskerton; Nelson Lane, Fiskerton (June 25); 41, Cameron Street, Heckington, Sleaford; Frampton Fen, Boston (June 26); Frampton Farm, Frampton Fen, Boston; 4, Kell Drove, Kirton Holme, Boston (June 27).

Sussex. Bunnythorpe Fields, Maynards Green, Horam (June 25).

Swine Fever

Berks. Kintbury Holt Farm, Kintbury, Newbury; Chez Peters Club, Rimenham Hill, Henley-on-Thames (July 2).

Ches. Mouldsworth Hall, Mouldsworth, Tarvin, Chester (June 26); The Dene House, Great Budworth, Northwich (June 29).

Devon. Dean Farm, West Down, Ilfracombe (June 26).

Dorset. Petties, Yetminster, Sherborne (June 29).

Essex. Bettina, King Edward Road, South Woodham Ferrers, Chelmsford (June 28); Sunnyview, Peartree Green, Doddinghurst, Brentwood (June 30).

Herts. Gladwyns Farm, Totteridge, N.20 (June 26); Bottom Farm, Northchurch, Berkhamsted (July 2).

Lancs. Jennet House Farm, Darwen (June 27).

Montgomery. Gwaelodywern, Llangadfan, Welshpool (June 26).

Norfolk. R.A.F. Station Farm, Marham, King's Lynn (June 29).

Perth. Lynton Pig Farm, Tofts, Stanley (June 30).

Salop. Grange Farm, Kinnerley, Oswestry (June 29).

Suffolk. Low Farm, Worlingworth (July 2).

Surrey. Merrywood Farm, Almers Road, Lyne, Chertsey (July 2).

Sussex. Commonland Farm, West Chiltington, Pulborough (June 25).

Yorks. Mere Lane Fisheries, Mere Lane, Armthorpe, Doncaster (June 26); Hull and Barnsley Gardens, Stoneferry Road, Hull (June 27); Piggery, Whitewell Hotel, Whitewell, Nr. Clitheroe (June 30).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Dislocation of the Hip

Sir,—It would appear from R. H. Franklin's letter (April 28th) that reduction of luxated hips is a waste of time since the condition recurs. This is an extraordinary statement and quite at variance with the facts. We are constantly being called on to correct dislocation of the hip and use the following technique:—

Reduction by manipulation is performed under general anaesthesia. If the limb can now be readily flexed without luxating, a figure eight bandage of adhesive plaster is applied. If the limb luxates when flexed, we use a sherman vitallium screw to fix the articulation, the track for the screw being cut with a power drill. The figure eight bandage is generally removed in four to five days and the screw in one week. X-radiology is used before and after operation and in no case has luxation recurred. It would appear that luxation of the hip joint is usually due to violence exerted on the lower limb whilst the body is free to move, since only rarely is there concurrent damage to the pelvis. So rare indeed, that in those patients where points of pelvis and femur can be readily palpated, one would be quite safe in proceeding with reduction without prior X-ray.

Treatment of congenital luxations however, is, in our opinion, useless.

Yours faithfully,
W. HOGARTH SCOTT,
J. AUTY.

6, McCrea Street,
Dandenong,
Victoria,
Australia.

June 12th, 1956.

Chlorpromazine Hydrochloride

Sir,—I was very interested to read Miss Weaver's paper on the use of chlorpromazine hydrochloride.

I have been using the substance in cases of caesarean section, reducing the dose of thiopentone sodium by approximately 50 per cent. and have found that the puppies are readily revived at birth by neonatal lethidrone. It would seem that there is no depression on the puppies' hearts, but that the respiratory centre is somewhat depressed. My experience has been that breathing starts about two to three minutes after intramuscular injection.

The experience in this practice of chlorpromazine hydrochloride shows an optimum time of injection of 30 to 45 minutes which is at variance with Miss Weaver's one and a half hours. We have found however that if a second injection is given at 45 minutes, with induction after a further 30-minute interval, there is a considerable slowing up of the rate of recovery. The bitch remains in a state of narcosis for 18 to 24 hours, and may show a slight degree of

ataxia for this period. Recovery by this means is remarkably free of any excitable stage, the bitch seeming to be perfectly content to lie still until the effects of the anaesthetic have worn off.

Yours faithfully,
E. M. PITTAWAY.

40, Queens Road,
Coventry,
Warwicks.

July 7th, 1956.

Removal of Abdominal Testicles in the Pig

Sir,—Your recent article by Johnston (1956) describing a technique for the removal of abdominal testicles in the pig, varies only slightly from the modification of White's method recommended by Gunning (1955). They vary considerably in their choice of anaesthetics, Johnston preferring intraperitoneal pentobarbitone sodium solution B.Vet.C., at a dosage rate of 1 c.c. per 4 lb. bodyweight, Gunning using a 5 per cent. chloral hydrate solution at a rate of 3 c.c. per lb. also intraperitoneally.

Our experience of this operation is limited to the last few years, and we are inclined to agree with Gunning that the greater demand for the operation is due to stricter grading on behalf of the bacon factories, despite statements in the Technical Development Committee's article, brought to our notice by Mr. Knowles in THE RECORD of May 26th. Johnston suggests that there has been an increased incidence due to more careful selection—a view which requires investigation—although we have seen no evidence to suggest that this is the case.

We have used a similar technique to the above, but prefer intravenous pentobarbitone sodium, the administration of which can be greatly facilitated by the use of a stout rubber band to raise the ear vein. Betts & Gibson (1954) recommended this method to facilitate the drawing of blood samples. The band is cut immediately blood enters the syringe, which must have an eccentric nozzle, and half the anticipated dose is given speedily in order to minimise struggling.

If the operation is performed before weaning, when the piglets are around 30 lb. bodyweight, the missing testicle can frequently be palpated using one hand. With the piglet lying on its right side the testicle is drawn to the left flank and fixed there by means of a large pair of rubber-covered bowel forceps. Through a small incision the testicle can then be withdrawn and the spermatic artery ligated with gut. The forceps are removed, the cord allowed to drop into the abdominal cavity and the wound closed with hardened gut sutures. The operation can be performed very speedily without any unnecessary exploration of the abdomen and with the wound in the flank, healing is, we think, better than when in the prepubic region. In older pigs this method is not satisfactory because palpation of the missing testicle with one hand is often impossible.

Yours faithfully,
RICHARD H. C. PENNY,
J. H. S. ARNOLD.

The Black Lion Yard,
High Street,
Leighton Buzzard,
Beds.

June 25th, 1956.

References

BETTS, A. O., & GIBSON, E. A. (1954). *Vet. Rec.* **66**. 130.
GUNNING, O. V. (1955). *B. Vet. J.* **3**. 122.
JOHNSTON, R. W. (1956). *Vet. Rec.* **68**. 277.

Abnormally Short Pregnancy

Sir,—In last week's VETERINARY RECORD there was a letter recording a prolonged gestation in a cow. Last week I encountered a pregnancy of apparently abnormally short duration in a three-year-old Kerry ewe. This ewe had normal twin lambs on March 16th this year. I saw her on June 28th when she had slight prolapse of the vagina which was easily reduced. On June 29th, she gave birth to a normal lamb weighing 11½ lb.

Yours faithfully,
R. H. VALE.

Kingston House,
Areley Kings,
Stourport-on-Severn,
Worcs.

July 2nd, 1956.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th June, 1956		11	1	—	28	—	32
Corresponding period in	1955	23	—	—	5	—	100
	1954	8	2	—	16	—	78
	1953	19	—	—	96	—	153
1st January to 15th June, 1956		1,003	6	12	269	—	350
Corresponding period in	1955	425	—	6	247	—	771
	1954	144	3	12	528	—	721
	1953	414	—	25	373	—	1,623